REMARKS

Reconsideration of this application as presently amended and in light of the following discussion is respectfully requested.

Claims 1-12 are pending in the present application. Claim 1 has been amended by the present amendment.

In the outstanding Office Action, Claim 1 was rejected under 35 U.S.C. § 103(a) as unpatentable over Kim (U.S. Patent No. 6,724,267, herein "Kim") in view of Rasmussen (U.S. Patent No. 5,561,398, herein "Rasmussen"); Claims 5 and 6 were indicated as allowable if rewritten in independent form; and Claims 2, 3, 4, and 7-12 were allowed.

Applicants thank the Examiner for the allowable subject matter.

In view of the rejection of Claim 1 under 35 U.S.C. § 103(a) as unpatentable over Kim in view of Rasmussen, Claim 1 is amended to recite that each amplifier is a non-differential input type and each amplifier has a first input, a second input, and a single-ended output. The claim amendments find support in Figure 1 and its corresponding description in the specification. No new matter has been added.

Briefly recapitulating, independent Claim 1 is directed to a voltage controlled oscillator that includes an even number of amplifiers. Each amplifier is a non-differential input type and has a first input, a second input, and a single-ended output. In a non-limiting example, Figure 1 shows the plurality of amplifiers 11a-11d with each amplifier having the first input, the second input, and the single-ended output.

Turning to the applied art, Kim shows in Figures 1-3 a cascaded voltage control oscillator having a plurality of LC-tank oscillators, each LC-tank oscillator having a plurality of outputs and each LC-tank oscillator being a differential input type. In other words, Kim shows that each amplifier (i) is a differential input type, and (ii) has a complimentary output.

Thus, the voltage controlled oscillator of Kim exhibits a phase noise due to thermal noise increases.

On the contrary, amended Claim 1 recites that each amplifier is a non-differential input type and has a single-ended output. Therefore, the phase noise due to thermal noise can be suppressed in the device of Claim 1.

A conventional ring oscillator exhibits a problem that a phase noise becomes large due to an effect of a disturbance signal from an outside because internal signals are not complementary to each other in a configuration in which an odd number of inverting amplifiers are connected in a ring when the oscillator does not employ differential amplifiers. In a conventional technology, no signal can be oscillated if an even number of stages of single-output amplifiers are connected in a ring.

However, according to the device of Claim 1, it is possible to operate a ring oscillator by arranging two-input amplifiers in such a configuration that their respective input signals may be outputs of the two amplifiers that are each distant by an odd number of stages therefrom.

The outstanding Office Action relies on Rasmussen for teaching a differential stage amplifier to be used in a ring oscillator. However, Rasmussen does not cure the deficiencies of Kim discussed above with regard to Claim 1.

Therefore, Applicants respectfully submit that even if one of ordinary skill in the art would combine the teachings of Kim and Rasmussen as suggested by the outstanding Office Action, that combination still fails to teach or suggest that each amplifier is a non-differential input type and each amplifier has a single-ended output as required by amended Claim 1.

Thus, it is respectfully submitted that independent Claim 1 and each of the claims depending therefrom patentably distinguish over Kim and Rasmussen, either alone or in combination.

Consequently, in light of the above discussion and in view of the present amendment, the present application is believed to be in condition for allowance and an early and favorable action to that effect is respectfully requested.

Respectfully submitted,

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